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considers in this volume only the Equisetales and Sphenophyllales. Both of these groups are abundantly preserved and well known. At the close of the volume is an excellent bibliography.

This work has at least three features to commend it that are by no means common to all books on paleobotany. It is extremely cautious in its statements; many forms commonly described are either classified tentatively or omitted altogether; there are not so many startling allusions to high grade plants in the early ages, but there are more real facts on which to base safe conclusions. Another valuable feature of the book is that important facts have been culled out from a mass of unimportant material, and by no means least in its commendable qualities is that it is actually readable; even the botanical or geological layman may enjoy it, if he cares for such things at all. Everyone who reads the first volume will anxiously await the appearance of the second.—HENRY C. COWLES.

MINOR NOTICES.

DR. L. M. UNDERWOOD read a wise and vigorous paper on the study of botany in high schools before the New York Science Teachers' Association last December. Copies from the *Journal of Pedagogy* for April have been distributed.

DR. W. F. GANONG published in this journal seven years ago (May 1891) a brief account of the raised peat bogs of New Brunswick. During the summers of 1895 and 1896 he was able to give these additional study, and has now published a much more complete and detailed description of the ecological and physical features of these interesting areas.[3]—C. R. B.

TWO BULLETINS of the U. S. Forestry Division have recently been issued.

Bulletin no. 15 is by F. V. Coville, on "Forest growth and sheep grazing in the Cascade mountains of Oregon." It furnishes an account of the methods of sheep grazing on the government reservations in the region named, and their relation to forest preservation both from overgrazing and from fires. Under recent legislation the Interior Department is empowered to make regulations governing grazing on public lands. This report suggests an equitable and apparently feasible system.

Bulletin no. 16 discusses the "Forestry conditions and interests of Wisconsin." It presents the information acquired by Mr. Filibert Roth, a special agent of the department, who made a forest census under the auspices of the state forestry commission and the natural history survey. Botanists will be glad to know that Wisconsin is awakening to an interest in rational forest management. The recommendations of Dr. Fernow, based upon the infor-

[3] Transactions of the Royal Society of Canada II. **2**: 131–163. *figs. 11.* 1897.

mation gathered by Mr. Roth, are as follows: (1) the appointment of a permanent forest commissioner or commission and a fire warden with suitable powers; (2) state control of the manner of exploiting the forest resources; (3) the acquisition of forest lands by the state at their market value, to be paid for in non-taxable scrip bearing 3 per cent. interest, payable after thirty years in yearly payments equaling 10 per cent. of the principal and accumulated interest; and (4) the good management of these lands by the employment of technical skill. To the latter end it is recommended that instruction in forestry be provided at the state university.— C. R. B.

DR. J. C. ARTHUR describes in *Proceedings* of the Indiana Academy of Science for 1897 a simple arrangement for securing uniform water power for use with physiological apparatus. He uses a tank, set in the upper story of the building, and kept filled from the city water supply by an automatic float valve, such as is used for water closet tanks. A small lead pipe, which can be put in place without skilled labor, siphons the water over the top of the tank — he uses a barrel — and is closed by a piece of rubber tubing and a pinch-cock below. A head of fifteen feet is sufficient to run a water motor which will drive a centrifuge. The uniform pressure is useful for many other purposes.— C. R. B.

DR. A. J. GROUT has prepared a list of the mosses of Vermont represented in the collections of Messrs. C. C. Frost, C. G. Blanchard, C. E. and E. Faxon, G. G. Kennedy, Mrs. E. G. Britton, and the author.[4] Dichotomous keys to both genera and species are provided, so that determinations are much facilitated. A number of species, reported but not known to be represented by specimens, are enumerated in a separate list. The arrangement of families and the nomenclature are modernized.—C. R. B.

THE NUMBER of species and varieties, not to mention the forms and subforms, of Sphagnum has grown so great and the synonymy is so intricate and confused that it is almost impossible for even a bryologist who is not a sphagnologist to find his way through the maze. M. Jules Cardot, an able student of this genus, has rendered his fellow bryologists a most acceptable service by publishing a catalogue of all the species and varieties, giving the synonymy, bibliography, and geographical distribution.[5] It is based upon the most recent work, especially upon Warnstorf's comprehensive studies.

[4] GROUT, A. J.—A list of the mosses of Vermont with analytical keys to the genera and species. 8vo. pp. 40. Published by the Botanical Department of the University of Vermont. 15 Mr. 1898.

[5] CARDOT, JULES.— Répertoire sphagnologique: catalogue alphabétique de toutes les espèces et variétés du genre Sphagnum, avec la synonymie, la bibliographie et la distribution géographique, d'après les travaux le plus récents. 8vo. pp. 200. Autun: De Jussieu Père et Fils. 1897.

Though obliged on account of their number to omit the forms and subforms, the catalogue contains 215 species, almost 600 varieties, and about 2000 bibliographical citations. The names are all alphabetically arranged, so that reference is easy. Synonyms appear in their proper place alphabetically and are also grouped chronologically under the species to which they are referred. Such work as this is too little appreciated, but deserves the fullest recognition because it saves others hours of time and does a great deal to facilitate study.

The paper is reprinted (and repaged) from the tenth volume of the *Bulletin de la Société d'Histoire Naturelle d'Autun* (for 1897), the first page of text (p. 3) corresponding to p. 235 of that volume.—C. R. B.

NOTES FOR STUDENTS.

IT IS CURIOUS to find M. Henri Coupin, in experiments to determine the toxic dose of various substances for plants, using *percentage* solutions. If the new knowledge of solutions has taught physiologists anything, it is that percentage solutions of different substances are absolutely incomparable, and to base a comparative research on them now is absurd. The first paper of a promised series is on the toxicity of sodium chloride and sea water.[6] The seedlings of peas and wheat were supported at the surface of the solutions by pins, whose corrosion no doubt adds considerably to the toxicity of the fluids. With such sources of error, the series of experiments does not promise to be valuable.—C. R. B.

MOST INVESTIGATIONS as to the effect of the X-rays seem to be yielding negative results. Schober and Müller find no heliotropic action; Beauregard and Guichard, and Atkinson find that they do not affect the vitality of bacteria; the latter also observed no effect on oscillarias or the sensitive plant. MM. Maldiney and Thouvenin now report[7] that the X-rays have no effect in the formation of chlorophyll. These investigators, however, show that the germination of certain seeds is hastened by exposure for an hour or more to X-rays.

THE LLOYD LIBRARY is coming to be known throughout this country and Europe as one of the most important botanical libraries. Two years ago we asked Mr. C. G. Lloyd to prepare for the GAZETTE a brief account of this library. He acceded to this request, but his absorption in other work and his frequent prolonged absences from this country have interfered with the plan. Now a description of the library has been published by Dr. E. Kremers, editor of the *Pharmaceutical Review*, in that journal (**16**: 85–94.

[6] Revue général de Botanique **10**: 177. May 1898.

[7] Revue général de Botanique **10**: 81. 1898.